AMENDMENTS TO THE CLAIMS

Please cancel claim 18 and amend the claims as follows:

1. (Currently Amended) A method [[of]] for forming a film on a substrate surface, comprising:

positioning a substrate within a process chamber;

exposing a ruthenium-containing compound to the substrate ~~surface~~, wherein the ruthenium-containing compound is selected from the group consisting of bis(dialkylpentadienyl)ruthenium compounds, bis(alkylpentadienyl)ruthenium compounds, bis(pentadienyl)ruthenium compounds, and combinations thereof;

purging the process chamber with a purge gas;

reducing the ruthenium-containing compound with a reductant to form a ruthenium layer on the substrate ~~surface~~; and

purging the process chamber with the purge gas.

2. (Currently Amended) The method of claim 1, wherein the ruthenium-containing compound comprises at least one alkyl group selected from the group consisting of methyl, ethyl, propyl, butyl, and combinations thereof.

3. (Original) The method of claim 2, wherein the at least one alkyl group is methyl.

4. (Original) The method of claim 2, wherein the ruthenium-containing compound is selected from the group consisting of bis(2,4-dimethylpentadienyl)ruthenium, bis(2,4-diethylpentadienyl)ruthenium, bis(2,4-diisopropylpentadienyl)ruthenium, bis(2,4-ditertbutylpentadienyl)ruthenium, bis(methylpentadienyl)ruthenium, bis(ethylpentadienyl)ruthenium, bis(isopropylpentadienyl)ruthenium, bis(tertbutylpentadienyl)ruthenium, and combinations thereof.

5. (Original) The method of claim 4, wherein the reductant comprises one or more reagents selected from the group consisting of oxygen, nitrous oxide, nitric oxide, nitrogen dioxide, and combinations thereof.

6. (Currently Amended) The method of claim 5, wherein the ruthenium layer is formed at a temperature within a range from about 200°C to about 400°C.

7. (Currently Amended) The method of claim 6, wherein a thickness of the ruthenium layer is about 100 Å and the ruthenium layer has a resistivity of less than 15 μΩ-cm.

8. (Currently Amended) The method of claim 6, wherein the ruthenium layer has a sheet resistance of less than 2,000 Ω/sq.

9. (Currently Amended) The method of claim 4, wherein the substrate surface further comprises a barrier layer selected from the group consisting of tantalum, tantalum nitride, tantalum silicon nitride, titanium, titanium nitride, titanium silicon nitride, tungsten, tungsten nitride, and combinations thereof.

10. (Currently Amended) The method of claim 4, wherein the substrate surface further comprises at least one low-k material selected from the group consisting of silicon dioxide, silicon nitride, silicon oxynitride, carbon-doped silicon oxides, SiO_xC_y, and combinations thereof.

11. (Currently Amended) A method for forming a layer comprising ruthenium on a substrate surface within a process chamber, sequentially comprising:

a) exposing [[the]] a substrate ~~surface~~ to bis(2,4-dimethylpentadienyl)ruthenium to form a ruthenium-containing layer on the substrate ~~surface~~;

b) purging the process chamber with a purge gas;

c) reacting a reducing gas with the ruthenium-containing layer; and

d) purging the process chamber with the purge gas.

12. (Original) The method of claim 11, wherein the reducing gas comprises one or more reagents selected from the group consisting of oxygen, nitrous oxide, nitric oxide, nitrogen dioxide, and combinations thereof.

13. (Currently Amended) The method of claim 12, wherein the layer is formed at a temperature within a range from about 200°C to about 400°C.

14. (Currently Amended) The method of claim 13, wherein a thickness of the ruthenium layer is about 100 Å and the ruthenium layer has a resistivity of less than 15 μΩ-cm.

15. (Currently Amended) The method of claim 13, wherein the ruthenium layer has a sheet resistance of less than 2,000 Ω/sq.

16. (Currently Amended) The method of claim 12, wherein ~~the ruthenium layer on~~ the substrate ~~surface~~ further comprises a barrier layer comprising a material selected from the group consisting of tantalum, tantalum nitride, tantalum silicon nitride, titanium, titanium nitride, titanium silicon nitride, tungsten, tungsten nitride, and combinations thereof.

17. (Currently Amended) The method of claim 12, wherein the substrate ~~surface~~ further comprises at least one low-k material selected from the group consisting of silicon dioxide, silicon nitride, silicon oxynitride, carbon-doped silicon oxides, SiO_xC_y, and combinations thereof.

18. (Cancelled)

19. (Currently Amended) A ~~The~~ method ~~of claim 18~~ for forming a ruthenium material on a substrate, comprising:

depositing a barrier layer on a substrate during a first ALD process, wherein the barrier layer comprises a material selected from the group consisting of tantalum,

tantalum nitride, tantalum silicon nitride, titanium, titanium nitride, titanium silicon nitride, tungsten, tungsten nitride, and combinations thereof; and

exposing the substrate sequentially to a ruthenium-containing compound and a reducing gas to form a ruthenium layer on the barrier layer during a second ALD process, wherein the ruthenium-containing compound is selected from the group consisting of bis(dialkylpentadienyl)ruthenium compounds, bis(alkylpentadienyl)ruthenium compounds, bis(pentadienyl)ruthenium compounds, and combinations thereof.

20. (Currently Amended) The method of claim 19, wherein the ruthenium-containing compound comprises at least one alkyl group selected from the group consisting of methyl, ethyl, propyl, butyl, and combinations thereof.

21. (Original) The method of claim 20, wherein the at least one alkyl group is methyl.

22. (Original) The method of claim 19, wherein the ruthenium-containing compound is selected from the group consisting of bis(2,4-dimethylpentadienyl)ruthenium, bis(2,4-diethylpentadienyl)ruthenium, bis(2,4-diisopropylpentadienyl)ruthenium, bis(2,4-ditertbutylpentadienyl)ruthenium, bis(methylpentadienyl)ruthenium, bis(ethylpentadienyl)ruthenium, bis(isopropylpentadienyl)ruthenium, bis(tertbutylpentadienyl)ruthenium, and combinations thereof.

23. (Currently Amended) The method of claim [[18]] 19, wherein the reducing gas comprises one or more reagents selected from the group consisting of oxygen, nitrous oxide, nitric oxide, nitrogen dioxide, and combinations thereof.

24. (Currently Amended) The method of claim 23, wherein the ruthenium layer is formed at a temperature within a range from about 200°C to about 400°C.

25. (Currently Amended) The method of claim 24, wherein a thickness of the ruthenium layer is about 100 Å and the ruthenium layer has a resistivity of less than 15 μΩ-cm.

26. (Currently Amended) The method of claim 24, wherein the ruthenium layer has a sheet resistance of less than 2,000 Ω/sq.

27. (Currently Amended) A method [[of]] for forming a ruthenium film on a dielectric material on a substrate, comprising:

positioning the substrate within a process chamber;

exposing a ruthenium-containing compound to the dielectric material, wherein the ruthenium-containing compound is selected from the group consisting of bis(dialkylpentadienyl)ruthenium compounds, bis(alkylpentadienyl)ruthenium compounds, bis(pentadienyl)ruthenium compounds, and combinations thereof;

purging the process chamber with a purge gas;

reducing the ruthenium-containing compound with a reductant to form the ruthenium layer on the dielectric material; and

purging the process chamber with the purge gas.

28. (Currently Amended) The method of claim 27, wherein the ruthenium-containing compound comprises at least one alkyl group selected from the group consisting of methyl, ethyl, propyl, butyl, and combinations thereof.

29. (Original) The method of claim 28, wherein the at least one alkyl group is methyl.

30. (Original) The method of claim 28, wherein the ruthenium-containing compound is selected from the group consisting of bis(2,4-dimethylpentadienyl)ruthenium, bis(2,4-diethylpentadienyl)ruthenium, bis(2,4-diisopropylpentadienyl)ruthenium, bis(2,4-ditertbutylpentadienyl)ruthenium, bis(methylpentadienyl)ruthenium, bis(ethylpentadienyl)ruthenium, bis(isopropylpentadienyl)ruthenium, bis(tertbutylpentadienyl)ruthenium, and combinations thereof.

31. (Original) The method of claim 27, wherein the reductant comprises one or more reagents selected from the group consisting of oxygen, nitrous oxide, nitric oxide, nitrogen dioxide, and combinations thereof.

32. (Currently Amended) The method of claim 31, wherein the ruthenium layer is formed at a temperature within a range from about 200°C to about 400°C.

33. (Currently Amended) The method of claim 32, wherein a thickness of the ruthenium layer is about 100 Å and the ruthenium layer has a resistivity of less than 15 μΩ-cm.

34. (Currently Amended) The method of claim 32, wherein the ruthenium layer has a sheet resistance of less than 2,000 Ω/sq.

35. (Currently Amended) The method of claim 30, wherein the dielectric material comprises at least one low-k material selected from the group consisting of silicon dioxide, silicon nitride, silicon oxynitride, carbon-doped silicon oxides, SiO_xC_y, and combinations thereof.

36. (Currently Amended) A method [[of]] for forming a ruthenium layer on a substrate surface, comprising:

positioning a substrate within a process chamber;

exposing the substrate ~~surface~~ to a ruthenium-containing compound comprising ruthenium and at least one open chain dienyl ligand;

forming a ruthenium-containing compound film on the substrate ~~surface~~;

purging the process chamber with a purge gas;

reducing the ruthenium-containing compound film with a reductant comprising at least one reagent selected from the group consisting of oxygen, nitrous oxide, nitric oxide, nitrogen dioxide, and combinations thereof; and

purging the process chamber with the purge gas.

37. (Original) The method of claim 36, wherein the ruthenium-containing compound is selected from the group consisting of bis(dialkylpentadienyl)ruthenium compounds, bis(alkylpentadienyl)ruthenium compounds, bis(pentadienyl)ruthenium compounds, and combinations thereof.

38. (Currently Amended) The method of claim 37, wherein the ruthenium-containing compound comprises at least one alkyl group selected from the group consisting of methyl, ethyl, propyl, butyl, and combinations thereof.

39. (Original) The method of claim 38, wherein the at least one alkyl group is methyl.

40. (Original) The method of claim 36, wherein the ruthenium-containing compound is selected from the group consisting of bis(2,4-dimethylpentadienyl)ruthenium, bis(2,4-diethylpentadienyl)ruthenium, bis(2,4-diisopropylpentadienyl)ruthenium, bis(2,4-ditertbutylpentadienyl)ruthenium, bis(methylpentadienyl)ruthenium, bis(ethylpentadienyl)ruthenium, bis(isopropylpentadienyl)ruthenium, bis(tertbutylpentadienyl)ruthenium, and combinations thereof.

41. (Currently Amended) The method of claim 40, wherein the ruthenium layer is formed at a temperature within a range from about 200°C to about 400°C.

42. (Currently Amended) The method of claim 41, wherein a thickness of the ruthenium layer is about 100 Å and the ruthenium layer has a resistivity of less than 15 μΩ-cm.

43. (Currently Amended) The method of claim 41, wherein the ruthenium layer has a sheet resistance of less than 2,000 Ω/sq.

44. (Currently Amended) A method [[of]] for forming a ruthenium layer on a low-k material, comprising:

positioning a substrate containing the low-k material within a process chamber;

maintaining the substrate at a temperature within a range from about 200°C to about 400°C;

exposing the low-k material [[with]] to a ruthenium-containing compound comprising ruthenium and at least one open chain dienyl ligand;

forming a ruthenium-containing compound film on the low-k material;

purging the process chamber with a purge gas;

reducing the ruthenium-containing compound film with a reductant comprising an oxygen-containing gas; and

purging the process chamber with the purge gas.

45. (Currently Amended) The method of claim 44, wherein the temperature is within a range from about 300°C to about 350°C.

46. (Currently Amended) The method of claim 45, wherein a thickness of the ruthenium layer is about 100 Å and the ruthenium layer has a resistivity of less than 15 μΩ-cm.

47. (Currently Amended) The method of claim 45, wherein the ruthenium layer has a sheet resistance of less than 2,000 Ω/sq.

48. (Currently Amended) The method of claim 44, wherein the low-k material comprises at least one material selected from the group consisting of silicon dioxide, silicon nitride, silicon oxynitride, carbon-doped silicon oxides, SiO_xC_y, and combinations thereof.

49. (Currently Amended) The method of claim 48, wherein the oxygen-containing gas comprises at least one reagent selected from the group consisting of oxygen, nitrous oxide, nitric oxide, nitrogen dioxide, and combinations thereof.

50. (Original) The method of claim 49, wherein the ruthenium-containing compound is selected from the group consisting of bis(dialkylpentadienyl)ruthenium compounds, bis(alkylpentadienyl)ruthenium compounds, bis(pentadienyl)ruthenium compounds, and combinations thereof.

51. (Currently Amended) The method of claim 50, wherein the ruthenium-containing compound comprises at least one alkyl group selected from the group consisting of methyl, ethyl, propyl, butyl, and combinations thereof.

52. (Original) The method of claim 51, wherein the at least one alkyl group is methyl.

53. (Original) The method of claim 48, wherein the ruthenium-containing compound is selected from the group consisting of bis(2,4-dimethylpentadienyl)ruthenium, bis(2,4-diethylpentadienyl)ruthenium, bis(2,4-diisopropylpentadienyl)ruthenium, bis(2,4-ditertbutylpentadienyl)ruthenium, bis(methylpentadienyl)ruthenium, bis(ethylpentadienyl)ruthenium, bis(isopropylpentadienyl)ruthenium, bis(tertbutylpentadienyl)ruthenium, and combinations thereof.

54. (Currently Amended) A method [[of]] for forming a ruthenium-containing layer on a low-k material, comprising:

positioning a substrate containing the low-k material within a process chamber;

maintaining the substrate at a temperature within a range from about 200°C to about 400°C;

exposing the low-k material to bis(2,4-dimethylpentadienyl)ruthenium to form a ruthenium-containing compound film;

purging the process chamber with a purge gas;

reducing the ruthenium-containing compound film with a gas comprising oxygen; and

purging the process chamber with the purge gas.

55. (Currently Amended) A method [[of]] for forming a ruthenium-containing layer on a copper-barrier material, comprising:

positioning a substrate containing a tantalum-containing material within a process chamber;

maintaining the substrate at a temperature within a range from about 200°C to about 400°C;

exposing the tantalum-containing material to bis(2,4-dimethylpentadienyl)ruthenium to form a ruthenium-containing compound film;

purging the process chamber with a purge gas;

reducing the ruthenium-containing compound film with a gas comprising oxygen; and

purging the process chamber with the purge gas.